AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1-27. (Cancelled)

28. (Currently amended) An apparatus for measuring the concentration of a substance in a sample and effective in removing nitrogen interference in pyro-electrochemical methods comprising:

    a. a thermal oxidizer to oxidize the substance into an oxidized substance;

    b. a removal device for selectively removing the nitrogen-containing interferant from the sample gas; and

    c. a detector, wherein the detector comprises an assembly of one or more electrochemical cells capable of detecting the oxidized substance.

29. (Original) The apparatus of claim 28, wherein the removal device is a scrubber.

30. (Original) The apparatus of claim 28, wherein the removal device selectively converts the nitrogen-containing interferant into a non-interfering species.

31. (Original) The apparatus of claim 30, wherein the removal device is a thermal converter.

32. (Original) The apparatus of claim 30, wherein the removal device comprises a catalyst.

33. (Original) The apparatus of claim 32, wherein the removal device is a catalytic converter.

34. (Original) The apparatus of claim 28, wherein the removal device comprises a scrubber and a converter.

35. (Original) The apparatus of claim 32, wherein the catalyst is in the form of chips or turnings.

36. (Original) The apparatus of claim 32, wherein the catalyst is in the form of wire, foil, or screen.

37. (Original) The apparatus of claim 32, wherein the catalyst consists of a series of screens.

38. (Original) The apparatus of claim 32, wherein the catalyst is Group VIB transition metal.

39. (Original) The apparatus of claim 38, wherein the catalyst is molybdenum.

40. (Original) The apparatus of claim 38, wherein the catalyst is operative in the range of about 300°C to about 550°C.

41. (Original) The apparatus of claim 40, wherein the catalyst is operative in the range of about 350°C to about 450°C.

42. (Currently amended) The apparatus of claim 2[9]8, wherein the thermal oxidizer additionally comprises a temperature control device, the temperature control device being effective for controlling the temperature of the removal device.

43. (Currently amended) The apparatus of claim 2[9]8, wherein the removal device additionally comprises a temperature control device.

44. (Original) The apparatus of claim 42, wherein the removal device additionally comprises a separate temperature control device.

45. (Currently amended) The apparatus of claim 2[9]8, wherein the removal device is composed of a material that is inert to the sample gas.

46. (Original) The apparatus of claim 45, wherein the material is capable of withstanding temperatures of up to about 550°C.

47. (Original) The apparatus of claim 46, wherein the material is stainless steel or quartz.

48. (Currently amended) The apparatus of claim 2[9]8, wherein the removal device comprises a housing, a first end cap and a second end cap.

49. (Original) The apparatus of claim 35, additionally comprising a catalyst retainer to hold the catalyst in place.

50. (Original) The apparatus of claim 49, wherein the catalyst retainer is stainless steel screen, molybdenum screen, quartz wool or a permeable quartz plug.

51. (Original) The apparatus of claim 48, wherein the housing additionally comprises an input and an output tube.

52. (Original) The apparatus of claim 51, wherein the input and output tubes are composed of stainless steel.

53. (Original) The apparatus of claim 38, wherein the converter operates at a temperature between about 300°C to about 550°C.

54. (Original) The apparatus of claim 53, wherein the converter operates at a temperature between about 350°C to about 450°C.

55. (Currently amended) The apparatus of claim 2[9]8, wherein the thermal oxidizer is insulated.

56. (Currently amended) The apparatus of claim 2[9]8, wherein the removal device is insulated.

57. (Currently amended) The apparatus of claim 2[9]8, wherein the removal device is located in a temperature controlled enclosure separate from that of the thermal oxidizer.

58. (Cancelled)

59. (Currently amended) An apparatus for measuring the concentration of a substance in a nitrogen-containing sample and effective in removing nitrogen interference in pyro-electrochemical methods comprising:

a. a thermal oxidizer to form an oxidized substance;

b. a converter, wherein said converter is effective for selectively converting the NO_2 in a sample to NO, and wherein the converter is a catalytic converter having a molybdenum catalyst, and wherein said converter further comprises a housing and an input and an output tube, and wherein said converter is composed of a material that is inert to the sample gas; and

c. a detector, wherein the detector comprises an assembly of one or more electrochemical cells capable of detecting the oxidized substance.

60. (Original) The apparatus of claim 59, wherein the converter operates at a temperature between about 300°C to about 550°

61. (Currently amended) The apparatus of claim [60] 59, wherein the thermal oxidizer additionally comprises a temperature control device, the temperature control device being effective for controlling the temperature of the converter.

62. (Currently amended) The apparatus of claim [60] 59, wherein the converter additionally comprises a temperature control device.

63. (Currently amended) The apparatus of claim [60] 59, wherein the thermal oxidizer is insulated, and further wherein the converter is insulated.

64. (Currently amended) The apparatus of claim [60] 59, wherein the converter is located in a temperature controlled enclosure separate from that of the thermal oxidizer.

65. (Currently amended) An on-stream analyzer for measuring the concentration of a substance in a nitrogen-containing fluid sample, said analyzer comprising:

a. a sample injector for injecting the sample at a preset and controlled rate, the sample injector further comprising a pressure regulator coupled to a flow restrictor to control the rate of sample flow;

b. a thermal oxidizer, to form an oxidized substance, comprising a tube furnace and a pyrolysis tube, connected to the sample injector;

c. a converter, wherein said converter is effective for selectively converting the NO_2 in a sample to NO, and wherein the converter is a catalytic converter having a molybdenum catalyst, and wherein said converter further comprises a housing and an input and an output tube, and wherein said converter is composed of a material that is inert to the sample gas;

d. a sample conditioner, connected to and located downstream from the thermal oxidizer, to control the conditions of a resulting gas mixture; and

e. a detector, connected to the sample conditioner, to measure the concentration of an oxidized substance contained within the gas mixture.

66. (Currently amended) An on-stream analyzer for detecting a substance in a nitrogen-containing fluid sample, said analyzer comprising:

a. a fluid sample injector;

b. a thermal oxidizer, connected to the sample injector, wherein the sample is injected into the thermal oxidizer and a carrier gas and a pyrolysis gas are

introduced to the sample under oxidation conditions to form an oxidized substance

c. a converter, wherein said converter is effective for selectively converting the NO_2 in a sample to NO, and wherein the converter is a catalytic converter having a molybdenum catalyst, and wherein said converter further comprises a housing and an input and an output tube, and wherein said converter is composed of a material that is inert to the sample gas;

d. a sample conditioner, connected to the thermal oxidizer, to control the conditions of a resulting mixture, wherein the conditioner further comprises a dryer for removing water vapor, wherein the dryer further comprises two concentric tubes, an inner tube composed of a membrane for transferring water vapor and an outer tube composed of an inert material, wherein the dryer is configured to operate so that a dry purge gas is directed through the inner tube and the sample gas is directed through the annular space between the inner and outer tube, and further wherein the inner tube is connected to a flow restrictor having an orifice to maintain positive pressure; and

e. one or more electrochemical cells, connected to the sample conditioner, to measure the concentration of [a] the oxidized substance contained within the sample.

67. (Currently amended) A method for detecting a substance in a sample comprising the steps of:

a. providing a nitrogen-containing sample in vapor state;

b. controlling the flow rate of the sample using a pressure regulator coupled to a fixed flow restrictor;

c. thermally oxidizing the sample to form an oxidized substance;

d. selectively converting NO_2 in the sample to NO, wherein the selective conversion step is accomplished using a catalytic converter having a molybdenum catalyst, from about 300°C to about 550°C, and wherein the flow rate through the catalytic converter is about 400 to about 800 sccm, and further wherein the pressure drop through the catalytic converter is less than about 1 inch of water;

e. cooling the sample, wherein the sample is cooled to ambient temperature within about one second after the selective conversion; and

f. detecting [a] the oxidized substance within the sample.

68. (Currently amended) A method for detecting a substance in a sample comprising the steps of:

a. providing a nitrogen-containing sample in vapor state;

b. thermally oxidizing the sample to form an oxidized substance;

c. conditioning the sample to control the temperature and relative humidity of the sample, wherein the temperature is regulated with a heat trace element comprising self-limiting electrical heating wires and wherein the relative humidity is controlled by a dryer comprising two concentric tubes, an inner tube composed of a ion-exchange membrane having sulfonic acid groups and an outer tube composed of a fluoropolymer resin or stainless steel, wherein a dry purge gas is directed through the inner tube and the sample gas is directed through the annular

space between the inner and outer tube, and further wherein the inner tube is connected to a flow restrictor having an orifice to maintain positive pressure;

d. selectively converting NO_2 in the sample to NO, wherein the selective conversion step is accomplished using a catalytic converter having a molybdenum catalyst, from about 300°C to about 550°C, and wherein the flow rate through the catalytic converter is about 400 to about 800 sccm, and further wherein the pressure drop through the catalytic converter is less than about 1 inch of water;

e. cooling the sample, wherein the sample is cooled to ambient temperature within about one second after the selective conversion; and

f. detecting [a] the oxidized substance within the sample.